

## 3 Concept of Operations in the Regional Context

As stated in Chapter 2, the Concept of Operations initiates and sets the foundation for the systems engineering process. It guides each step of the process and serves to validate the system when it becomes fully operational. This is true regardless of the scope or complexity of the project. However, developing and using a Concept of Operations for a project involving regional integration presents special challenges. This chapter discusses the context of a regional initiative and the implications this has for development of a Concept of Operations.

### 3.1 CHAPTER OVERVIEW

3.1.1 The purpose of this chapter is to discuss the necessity of developing a Concept of Operations for a regional integration project and to address the challenges posed by the demands inherent in such a project. Its objectives are:

- To describe the context wherein regional projects emerge.
- To discuss the importance of a Concept of Operations for a regional integration initiative
- To describe the difficulties involved in developing and using a Concept of Operations for a regional initiative.

3.1.2 Relationship to Previous Chapter – Chapter 2 provided an overview of the Systems Engineering process. This chapter delves more into the Concept of Operations phase of the systems engineering process. It discusses the necessity and challenge of developing a thorough Concept of Operations to launch the Systems Engineering process for a regional integration project.

3.1.3 Chapter Sections:

- The Regional Context
  - Planning Activities and Regional Projects
- The Importance of a Concept of Operations for a Regional Integration Project
  - Support for High-Level Functional Requirements
- Challenges Posed by a Regional Integration Initiative
- Chapter Summary
- Specific Literature Supporting This Chapter

## 3.2 The Regional Context

The idea for the launching of a regional initiative does not materialize from barren soil. Generally, dynamic processes are already occurring. Planning is integral to the organization and maintenance of any transportation network. It is likely that the idea for an integrated traffic management system will have its roots within the planning context.

### 3.2.1 Planning Activities and Regional Projects

ITS Architecture has been the focus of many regional planning activities. "The National ITS Architecture provides a common framework for planning, defining, and integrating intelligent transportation systems." U.S. Department of Transportation (DOT) requires regions to develop a Regional ITS Architecture (if agencies intend to use the Highway Trust Fund to finance ITS projects). The Regional ITS Architecture is based on the National ITS Architecture but tailored to address the local situation. "It is a plan for the deployment of electronic technology throughout a region with a focus on integration of systems within the region. The architecture identifies stakeholders, systems or 'elements' they operate and the information to be exchanged between stakeholder elements. The architecture also provides selected standards for information exchange." (Mark Thomas. "Regional ITS Architecture for Northern Eastern Illinois, Project Summary." Spring 2003) ITS Architecture has a 10-20 year planning horizon. Detailed information about ITS Architecture is available at <http://www.iteris.com/itsarch>.

A complementary process that is closely related to the Regional ITS Architecture is Regional Transportation Operations Collaboration and Coordination (RTOCC), which was described in a December 2002 FHWA Primer, *Regional Transportation Operations Collaboration and Coordination: A Primer for Working Together to Improve Transportation Safety, Reliability, and Security*. RTOCC has emerged as a process that enables transportation managers and officials to work together at a regional level to address operational problems and improve communication. A transportation management tool growing out of this process is the Regional Concept for Transportation Operations (RCTO). A RCTO outlines 2 – 5 year transportation operations objectives for a region. In our interview with the principal author of the above referenced primer, he described this tool as an important link between planning and operations. It fosters high-level institutional relationships, helps identify regional needs, and engenders high-level explanations of how to address the needs.

With input from regional stakeholders, such as Metropolitan Planning Organizations (MPOs), state Departments of Transportation (DOTs), Emergency response agencies, and local governments, RTOCC may develop plans for regional operations. To make these plans a reality, they must be implemented. Any number

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of specific projects may be identified by this process; each of these projects can be developed using Systems Engineering, the first phase of which should be the development of a thorough Concept of Operations. The projects are planned and developed in consultation with the Regional ITS Architecture. The diagram in Figure 3.1 depicts the relationship between the ITS Architecture, RTOCC, and Concepts of Operations for specific regional projects.

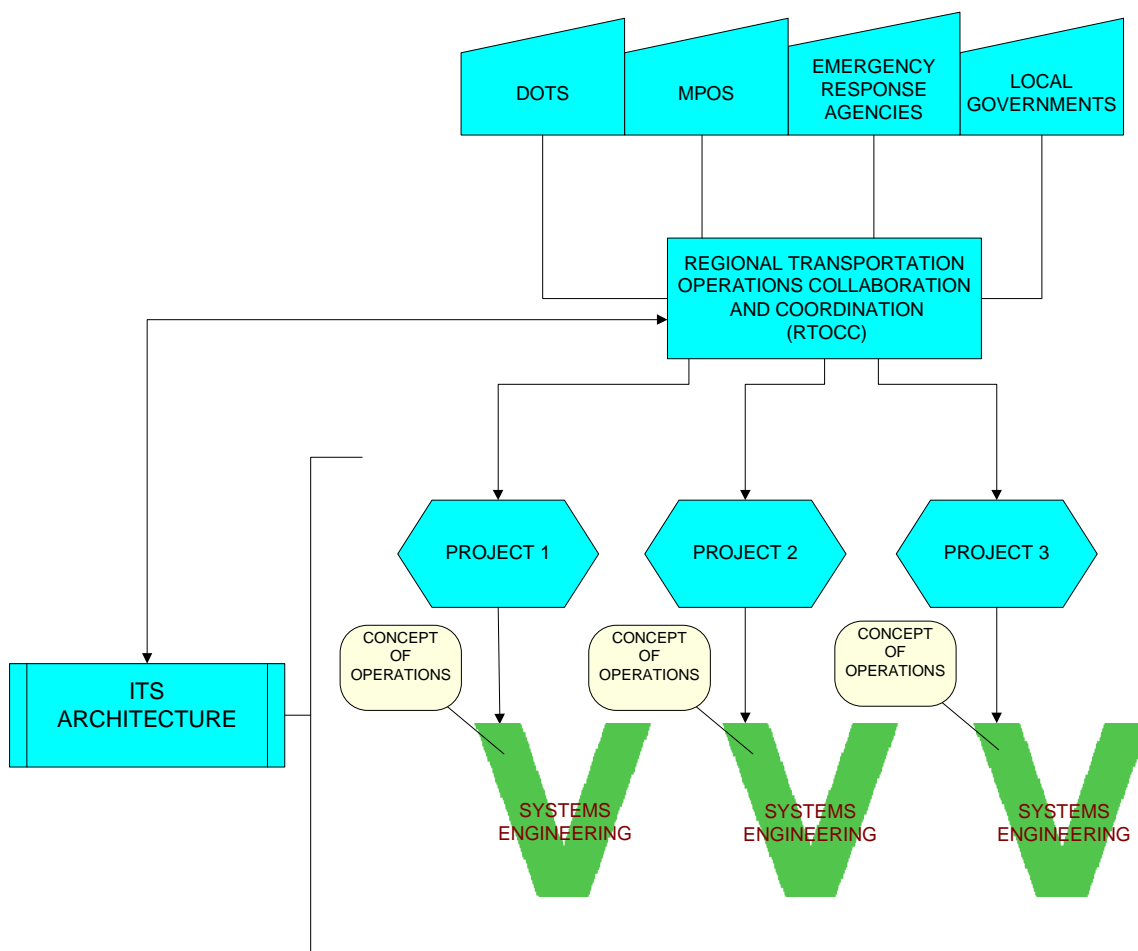


Figure 3.1 - Concept of Operations, ITS Architecture, and RTOCC

This diagram shows how RTOCC, with input from regional stakeholders and ITS Architecture, can develop plans for regional operations leading to individual projects, each of which can be implemented using Systems Engineering guided by a Concept of Operations.

It is important to differentiate here between transportation documents with similar sounding names: Operational Concept, Regional Concept of Transportation Operations (RCTO), and Concept of Operations.

- In support of the Regional ITS Architecture described above, the **Operational Concept** describes the roles and responsibilities of regional stakeholders at a

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high-level. This is a generic description in the sense that it does not relate to a specific project or initiative within the region.

- A **Regional Concept of Transportation Operations (RCTO)** is closely related to the ITS Architecture Operational Concept. A major difference is that the Operational Concept focuses on ITS components, while RCTO focuses on the operation of the entire transportation system. As a product of RTOCC, the RCTO is concerned with *identifying and phasing regional ITS projects*.
- A **Concept of Operations** is associated with a single project that covers, not only roles and responsibilities on the project, but the overall environment in which the system(s) of the project will operate. It starts and guides development of a specific initiative.

The Maricopa Association of Governments Regional Concept of Transportation Operations is a good example of this "planning to project" process. It is described in Figure 3.2 below:

Regional  
Example

## **Maricopa Association of Governments Regional Concept for Transportation Operations**

The MAG RCTO was the outcome of its ITS Strategic Plan Update for implementing ITS Architecture in the region. In shaping a regional vision, the Maricopa Association of Governments (MAG) Intelligent Transportation Systems (ITS) Committee considered several perspectives, including city, county, regional, state and federal, as well as transit and emergency services agencies. They began with the then current status of transportation operations and existing cooperative agreements in order to differentiate between regional and local functions. This generative approach enabled them to determine which functions "would provide greater benefit if approached at the regional level". They demonstrated needs, identified challenges, established goals (3 and 5 Year), and developed performance measures related to those goals. Eleven initiatives and their associated functions (action steps) were established in order to implement the goals. In our interview with the MAG ITS and Transportation Safety Program Manager, he stated: "These functions were the first steps in implementing specific programs, such as integrated signal optimization." The initiatives and functions are depicted in the graphic below:

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## Initiatives

Eleven **initiatives** are recommended as a framework of actions for the region to follow in pursuit of the stated vision of providing a safe, reliable, efficient and seamless surface transportation system. Through these initiatives, the goals established for the ten categories of regional operations can be achieved. Associated with each initiative are the **functions**, or action steps, to be carried out in executing the initiative. These functions are at the core of implementing the Regional Concept of Transportation Operations recommendations.

INITIATIVES		FUNCTIONS
REGIONAL TRAFFIC SIGNAL OPTIMIZATION PROGRAM	Improved traffic signal timing within cities and across jurisdictional boundaries will result from better regional traffic engineering collaboration.	<ul style="list-style-type: none"><li>▪ Optimize agency traffic signal system operations.</li><li>▪ Optimize traffic signal operations of cross-border traffic signals and regional arterials.</li><li>▪ Develop regional pre-set traffic signal timing structure and criteria for traffic signal timing plan changes during incidents.</li></ul>
ARTERIAL AND FREEWAY INCIDENT MANAGEMENT	Improved incident management can be achieved with better collaboration of the fire and public safety personnel with the transportation departments.	<p><u>Freeways</u></p> <ul style="list-style-type: none"><li>▪ Improve agency-specific incident management practices and guidelines to reduce incident clearance times.</li><li>▪ Schedule incident debriefing sessions after large incidents with representatives of public safety, fire departments, and applicable local transportation agencies.</li></ul>

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INITIATIVES		FUNCTIONS
ARTERIAL AND FREEWAY INCIDENT MANAGEMENT (CONTINUED)		<ul style="list-style-type: none"> <li>▪ Improve the pre-qualified list of towing and recovery vehicles.</li> <li>▪ Facilitate agreements between agencies to extract computer-aided-dispatch (CAD) information for travel information services and ADOT TOC.</li> <li>▪ Facilitate improvement of practices for on-scene coordination and communication.</li> <li>▪ Facilitate improvement of practices for placement of emergency vehicles at incident scenes.</li> </ul> <p style="text-align: center;"><u>Arterials</u></p> <ul style="list-style-type: none"> <li>▪ Implement and maintain a multi-jurisdictional Arterial Incident Management Program, based on results of feasibility study and pilot project.</li> <li>▪ Facilitate agreements between agencies to extract CAD information for local traffic management centers.</li> </ul>
SHARED MAINTENANCE RESOURCES	Improved system performance and significant cost savings to the region will result from sharing resources (staff and equipment).	<ul style="list-style-type: none"> <li>▪ Improve preventive maintenance and prompt repair of locally owned ITS field devices and central systems.</li> <li>▪ Improve preventive maintenance and prompt repair of regionally significant ITS field devices and central systems.</li> <li>▪ Maintain regional communications infrastructure.</li> <li>▪ Develop cost sharing agreements between agencies.</li> </ul>
FREEWAY- ARTERIAL OPERATIONS	An emphasis and focus on improving the operations of the arterials and freeways at traffic interchanges can be beneficial in optimizing the operation of the freeways and arterials.	<ul style="list-style-type: none"> <li>▪ Plan, deploy, operate and maintain a freeway-arterial corridor operations pilot project.</li> </ul>
EMERGENCY VEHICLE SIGNAL PREEMPTION	Preemption on a regional basis will be more effective and safer with a common set of standards for its implementation.	<ul style="list-style-type: none"> <li>▪ Develop regionally accepted standard for emergency vehicle signal preemption.</li> </ul>
TRANSIT SIGNAL PRIORITY	The implementation of transit signal priority on a corridor will demonstrate the effectiveness of this concept for regional transit mobility.	<ul style="list-style-type: none"> <li>▪ Plan, deploy, operate, maintain and evaluate a Transit Signal Priority pilot project.</li> </ul>

INITIATIVES		FUNCTIONS
CENTER-TO-CENTER COMMUNICATIONS	Better communications between agencies.	<ul style="list-style-type: none"> <li>Establish center-to-center communications between agencies.</li> </ul>
ARCHIVED DATA	Collecting and storing data from implemented transportation systems will be an excellent resource for the region in planning operational enhancements.	<ul style="list-style-type: none"> <li>Develop and implement a regional data archiving system.</li> </ul>
LOCAL TMC AND ADOT TMC OPERATORS	The effectiveness of TMC operators will be improved with better coordination and communication between themselves.	<ul style="list-style-type: none"> <li>Develop and maintain a comprehensive personnel and logistics resource list.</li> <li>Develop practices for after-hours monitoring of local TMC systems and devices.</li> <li>Improve inter-agency communication between TMCs during incidents.</li> </ul>
TRAVEL INFORMATION	Improved travel information in the MAG region will benefit the regional mobility.	<ul style="list-style-type: none"> <li>Make available work zone and incident information to HCRS and/or 511.</li> <li>Integrate transit information with travel information services (e.g., provide AVL data to 511).</li> <li>Develop practices for collecting information from arterial detectors.</li> <li>Post travel information/messages on freeway and arterial VMS.</li> <li>Market travel information services.</li> </ul>
PERFORMANCE MEASUREMENT	The effectiveness of all the initiatives can be measured through a performance measurement program.	<ul style="list-style-type: none"> <li>Develop performance measurement program.</li> </ul>

The MAG RCTO also contained an implementation strategy and Transportation Operations Guidelines, a tool to assist agencies in implementing the identified functions.

The RCTO is a planning and management tool that uses the Regional ITS Architecture to *identify and phase* regional ITS initiatives. A Concept of Operations and the systems engineering process can then be used to develop the specific regional integration projects (called initiatives in this example).

Figure 3.2 - Maricopa Association of Governments Regional Concept of Transportation Operations

This figure describes how the MAG region performed regional transportation planning, resulting in a Regional Concept for Transportation Operations (RCTO), to be implemented with a shorter time horizon than Regional ITS Architecture. A table contains a list of identified initiatives with their associated functions. These functions can guide the creation of specific regional projects for which a Concept of Operations can be developed.

## 3.3 THE IMPORTANCE OF A CONCEPT OF OPERATIONS FOR A REGIONAL INTEGRATION PROJECT

For the kinds of integration initiatives that might be considered necessary for a regional implementation (e.g., foreseeing and managing traffic for special events, enhancing response during emergencies, transit fare collection, signal system coordination), a shared set of expectations, defined by a Concept of Operations, is critical for building-in and maintaining system performance and reliability.

The systems engineering process becomes more difficult to perform when a project involves the integration of regional components. Given the challenges posed by such an undertaking, a thorough Concept of Operations is essential to provide structured, comprehensive guidance by:

- Identifying, and serving as a tool to engage the diverse array of stakeholders who will be impacted by the proposed regional integration.
- Identifying the users of the proposed system so that a description of user needs can be developed.
- Developing goals and objectives based on identified user needs and an agreed upon vision for the regional initiative.
- Revealing institutional barriers to collaboration and suggesting ways to surmount such obstacles.
- Describing the current infrastructure and institutional framework.

"The description of the existing system provides an agreed context for system development. All of the participants need to understand the elements of all systems to be managed. As additional participants are added they will need this context for what they are building upon. The existing system description can probably be assembled, in large part, from existing planning documents and from the legacy systems description of the regional ITS architecture." (FHWA White Paper: Regional Concepts of Operations for Transportation System Management and Operations, Discussion Draft 2.1, February 6, 2003)

- Providing a comprehensive view of how the proposed system should function under expected conditions (scenarios).
- Describing the current operations within the region and describing how those operations will be affected by the proposed regional project.



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- Differentiating between those functions and services that would provide greater benefit if approached at the regional level and those that should continue to be performed at the local level.
- Identifying the resources necessary to build, operate, and maintain the new system.
- Detailing the number and types of agreements needed to implement the proposed project.
- Defining the roles and responsibilities of the various agencies that will build, operate, and maintain the proposed system.

## 3.3.1 SUPPORTING HIGH-LEVEL FUNCTIONAL REQUIREMENTS

The Concept of Operations describes, in laymen's terms, the needs and expectations for a proposed system from the user viewpoint. It describes how the system will work once it's built. This description should address current operations, needs not satisfied by the current system, the proposed system, context and scope of the proposed system, scenarios showing how the proposed system should operate under expected conditions, and resources required to build, operate, and maintain the new system.

This concept description should be adequate to support the next step in the systems engineering process, the development of high-level functional requirements. Functional Requirements spell out the capabilities of the system in greater detail, with a view toward design and implementation. It asks: "What needs to be done to implement the user-defined system that was described in the Concept of Operations?" It is important to note that the persons who develop the Concept of Operations are often not the same persons who develop the functional requirements. The latter will need to be able to *use* the Concept of Operations to specify requirements for the proposed system.

Providing a clear and complete statement of the needed capabilities of the system can be especially challenging for a project involving regional integration. Among these challenges are: 1) to provide an adequate description of desired capability so that no confusion could arise when developing requirements for interconnectivity among the various ITS elements; 2) to support the development of adequate data sharing capabilities between the cooperating jurisdictions; 3) to support the development of a security system which will prevent unauthorized users from getting access to the system; and 4) to ensure that cooperating jurisdictions have compatible equipment and software so as to make interconnections simple, faster and less costly.

By comprehensively describing the needs and expectations of users in the region, a Concept of Operations aids in the development of user requirements for a regional

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integration initiative and helps avoid costly changes much later in the development process.

## 3.4 CHALLENGES POSED BY A REGIONAL INTEGRATION INITIATIVE

Developing a project involving regional integration presents unique challenges because, as compared with a stand-alone TMC or a localized system, in a regional system there is:

- Greater difficulty in identifying and bringing together stakeholders, who represent diverse and sometimes competing interests.

The Washington Metropolitan region will attempt to integrate existing transportation information and management systems in Virginia, Maryland, and the District of Columbia into a Regional Integrated Transportation Information System (RITIS). Their draft stakeholder description (See Figure 3.3 below) is a good example of the large number and diverse types of agencies that have an interest and stake in regional TMC operations:

<http://www.mwcog.org/uploads/committee-documents/t1xYV1k20050406154100.pdf>

Regional  
Example

### **Metropolitan Washington Regional ITS Architecture Draft Stakeholder Description**

## Stakeholder Description

### Stakeholder Name

### Stakeholder Description

CapCOM

The Washington Metropolitan region will integrate existing transportation information and management systems in Virginia, Maryland, and the District of Columbia into a Regional Integrated Transportation Information System (RITIS). CapCOM center will host the RITIS.

RITIS collects data of regional interest and fuses these data into regional information that can be used to enhance regional traveler information and transportation management functions performed by member agencies. Member agencies include : FHWA, Metropolitan Washington Council of Governments (COG); Virginia DOT; Maryland State Highway Administration; DC Department of Public Works; Washington Metropolitan Area Transit Agency; Montgomery County Department of Public Works

DDOT

DDOT manages and maintains the majority of the roads, streets, bridges, traffic signals, and related transportation infrastructure within the District of Columbia. DDOT is responsible for the management and response to regional emergencies regarding streets and roadways in the District of Columbia. DDOT operates the DC Integrated Transportation Management System (ITMS).

District of Columbia Public Safety and Emergency Management

DC safety agencies represent the police, fire rescue and other emergency services provided by the DC.

Dulles Greenway

Greenway Center-Private Road Operation in Loudoun county

Event Promoters

These agencies include all the event planners and the major attractions in the Region.

Federal Agencies

Federal Agencies are major employment centers in the region.

General Public

The community or the people as a whole using the transportation system. The general public may be an automobile driver, transit passenger, computer, or cell-phone user obtaining travel information, or any other person interacting with the transportation system in the Region.

I-95 Corridor Coalition

The I-95 Corridor Coalition is an alliance of transportation agencies, toll authorities, and related organizations, including law enforcement, from the State of Maine to the State of Florida, with an affiliate member in Canada. The Coalition provides a forum for key decision and policy makers to address transportation management and operations issues of common interest.

Local Public Safety and Emergency Management

Regional county government operations are included within the Region. Departments typically participating in emergency management operations include county police, fire, EMS, 911, and emergency management agencies.

Local Signal Agencies

The City of Bowie, the City of College Park, Montgomery County, the City of Gaithersburg, the City of Greenbelt, the City of Takoma Park, Prince George's County, the City of Rockville, and Frederick County are local government members of the TPB in Maryland. The City of Alexandria, Arlington County, the City of Fairfax, Fairfax County, the City of Falls Church, Loudoun County, the City of Manassas, and Prince William County are local government members of the TPB in Virginia. These local jurisdictions own and maintain a variety of local roadways and streets, and in some cases provide local transit services.

Local Transit Agencies

Agencies operating public transportation services within the Region.

Maryland Public Safety and Emergency Management

MD safety agencies represent the police, fire rescue and other emergency services provided in MD.

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## Metropolitan Washington Regional ITS Architecture

## DRAFT Stakeholder Description

### *Stakeholder Name*

### *Stakeholder Description*

Maryland State Highway Administration (MDSHA)

SHA is responsible for a large number of the major highways and associated bridges, traffic signals, signage, and other infrastructure in the State of Maryland, including Frederick, Montgomery, and Prince George's counties and local jurisdictions in the Washington metropolitan area. (Note that some roadways within those counties are under county or local jurisdictional responsibility.) SHA operates the Coordinated Highways Action Response Team (CHART) and its traffic operations centers (TOCs) statewide, including its main hub the Statewide Operations Center (SOC) located in Hanover, Maryland, near BWI Airport. The CHART SOC and TOC staffs provide primary support for transportation emergency preparedness and response in Maryland.

MDDOT

Maryland Department of Transportation.

Media

The regional media consists of all regional/local television and radio stations that provides weather, traffic, and other information to the general public via means of mass communication.

Metropolitan Washington Airports Authority(MWAA)

MWAA owns and operates Ronald Reagan Washington National Airport (DCA) in Arlington and Washington Dulles International Airport (IAD) near Sterling, Virginia.

Metropolitan Washington Council of Governments(MWCOG)

COG is the regional organization of Washington, D.C., area local governments. COG's members are the elected officials from 17 local governments in the National Capital Region, plus area delegation members from the Maryland and Virginia legislatures, the U.S. Senate, and the U.S. House of Representatives. COG provides a focus for action and develops sound regional responses to such issues as the environment, affordable housing, economic development, health and family concerns, human services, population growth, public safety, and

Mid-Atlantic Communications for Interoperability Partnership (MACIP)

CapWIN is a state-of-art wireless integrated mobile data communications network being implemented to support federal, state, and local law enforcement, fire and emergency medical services (EMS), transportation, and other public safety agencies primarily in the Washington, DC Metropolitan area.

MTA

MTA provides a network of transit and rail and freight services to customers throughout Maryland. MTA operates (or contracts to private providers who operate) commuter bus services that connect Washington-area employment areas to Baltimore, southern Maryland, and other areas outside metropolitan Washington. MTA also administers the MARC train service (see separate entry).

National Park Service/United States Park Police (NPS/NSPP)

The United States Park Police is a unit of the Department of the Interior, National Park Service, National Capital Region, with jurisdiction in all National Park Service areas and certain other federal/state lands. NPS owns and polices some major roadways in the Washington metropolitan area, including the Baltimore-Washington Parkway, the Clara Barton Parkway, Memorial Bridge, Rock Creek Parkway, the Suitland Parkway, and the George Washington Memorial Parkway, as well as major portions of Constitution Avenue, Independence Avenue, and other roadways in and around the National Mall in Washington.

Northern Virginia Transportation Commission (NVTC)

The Northern Virginia Transportation Commission works as a planning and coordinating body for transportation in Northern Virginia and, with PRTC, owns the Virginia Railway Express.

Regional Toll Administration Agency

Toll agencies in the region.

Regional ISP

Information Service Providers (ISP) who provide value added transportation information to the public in the region.

Regional Transit Electronic Clearinghouse

Regional electronic Fare system for WMATA, Fairfax County Connector, City of Fairfax CUE, Montgomery County Ride On, Arlington County ART, MARC, DASH, VRE PRTC, MD MTA.

University of Virginia

The University of Virginia operates the Smart Travel Laboratory and conducts transportation research.

Metropolitan Washington Regional ITS Architecture		DRAFT Stakeholder Description
<i>Stakeholder Name</i>	<i>Stakeholder Description</i>	
VDOT NOVA District	The Northern Virginia District (NOVA) of the Virginia Department of Transportation (VDOT) is comprised of VDOT owned and operated facilities located within the jurisdictions of Arlington, Fairfax, Loudoun and Prince William Counties; the Cities of Alexandria, Fairfax, Falls Church, Manassas, Manassas Park; and the Towns of Herndon, Clifton, Dumfries, Middleburg and Leesburg. The NOVA Smart Traffic Center operates the Interstate roadways in Northern Virginia. The NOVA Safety Service Patrol provides field incident management and motorist assistance on the Interstate roadways. The NOVA Smart Traffic Signal System operates traffic signals throughout Fairfax, Loudoun and Prince Williams Counties. Many jurisdictions located within the boundaries of the VDOT Northern Virginia (NOVA) District are responsible for operating and maintaining the secondary roadways and for providing emergency services within their borders. VDOT NOVA is also responsible for clearing state-maintained roads (snow removal), all cities, as well as Arlington County clear their own streets.	
Virginia Department of Transportation (VDOT)	VDOT is responsible for building, maintaining, and operating state roads, bridges, and tunnels. VDOT owns and operates most major and local streets and roadways in the counties of Fairfax, Loudoun, and Prince William in the Washington metropolitan area, as well as major highways in Arlington County and the cities and towns in Northern Virginia (See separate entry for Virginia local jurisdictions). VDOT statewide systems include but not limit to statewide video sharing, electronic toll collection, archive data sharing, emergency management, and weather information, etc.	
Virginia DMV	The Virginia Department of Motor Vehicles (DMV) is responsible for truck weigh stations and credentialing in the NOVA District.	
Virginia Public Safety and Emergency Management	VA safety agencies represent the police, fire rescue and other emergency services.	
Virginia Railway Express (VRE)	VRE is a transportation partnership of the Northern Virginia Transportation Commission (NVTC) and the Potomac and Rappahannock Transportation Commission (PRTC). VRE provides commuter rail service from the Northern Virginia suburbs to Alexandria, Crystal City, and downtown Washington, D.C., including Union Station and L'Enfant Plaza Station in Washington. Origin jurisdictions include Stafford County, Prince William County, and Fairfax County and the cities of Fredericksburg, Manassas, and Manassas Park.	
Virginia State Police	Safety agencies represent the police, and other emergency services provided by the Virginia	
Washington Metropolitan Area Transit Authority (WMATA)	WMATA operates the MetroRail transit system (subway) and much of bus network in the Washington DC metropolitan area and MetroAccess, the ADA paratransit program for the Washington D.C. Metropolitan area. WMATA also manages and maintains (including snow removal): parking facilities associated with rail stations, rail maintenance yards, bus garages and bus maintenance facilities. WMATA right-of-way supports fiber optic infrastructure for WMATA and area vendors as well as radio transmission facilities for WMATA and the region. As a regional compact agency, WMATA plays a leading role coordination transit in the region including regional fare payment system, incident and emergency management, special event and local transit providers.	

Figure 3.3 - Metropolitan Washington Regional ITS Architecture Draft Stakeholder Description

This figure lists and describes the various stakeholders for the Regional Integrated Transportation Information System (RITIS) for the Washington, D.C. metropolitan region.

- A more complex process for forging essential agreements.

*National Cooperative Highway Research Program, Synthesis 337, Cooperative Agreements for Corridor Management* reported on a survey of 22 transportation

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agencies in its study of cross-jurisdictional agreements. This quote from the summary of this report gives a flavor of the difficulties posed in creating, maintaining, and implementing such agreements:

"A variety of institutional, political, economic, and interpersonal factors were identified as potentially derailing the agreement process or causing an agreement to be unsuccessful. Institutional factors included bureaucratic resistance to long-term commitments, agency reluctance to assume a leadership or mediation role, and lack of internal cooperation across divisions. Political factors included turnover of elected officials, reluctance to adhere to prior commitments, intergovernmental competition, perceived inequity in the allocation of responsibilities and resources, growth/no-growth politics, or anti-government attitudes. A general lack of trust, personality conflicts, or even controversy over unrelated community issues can destabilize support for the agreement."

- A greater need for communication, while communication is usually more difficult to establish and maintain

An ITS Transportation Safety Program Manager spoke to this issue when we interviewed him in conjunction with preparing this guide: "Issues are arising now around the establishment of center-to-center communication. Because of liability issues, some jurisdictions do not want to give access to video camera recordings; they are much more willing to share maintenance resources."

- A greater need for the coordination of management and control (interoperability) of the system, which is made more difficult by inter-jurisdictional institutional barriers.

Figure 3.4 displays an excerpt from a brochure entitled, *When They Can't Talk, Lives are Lost: What Public Officials Need to Know about Interoperability* (February 2003), prepared through the collaboration of numerous Public Safety/Emergency Services stakeholders. This excerpt addresses the issue of barriers to interoperability across jurisdictions.

Regional  
Example

## **When They Can't Talk, Lives are Lost: What Public Officials Need to Know about Interoperability**





**“***Imagine a different public safety communications future. A future where emergency responses are coordinated, where information is shared in real time, where precious minutes are not wasted, and where emergencies are handled more effectively and safely.***”**

*Judi Wood, Chief  
Information Officer,  
Maryland Department  
of Public Safety and  
Correctional Services*

## ***Why Aren't Public Safety Communications Already Interoperable?***

**F**ive key reasons. Incompatible and aging communications equipment, limited and fragmented funding, limited and fragmented planning, a lack of cooperation and coordination, and limited and fragmented radio spectrum.

- ◆ Different jurisdictions use different equipment and different radio frequencies that cannot communicate with one another, just as different computer operating systems will not work together or an AM receiver will not accept an FM signal. There are limited uniform standards for technology and equipment.
- ◆ There is limited funding to replace or update expensive communications equipment, and different communities and levels of government have their own budget cycles and funding priorities.
- ◆ Planning is limited and fragmented. Without adequate planning, time and money can be wasted and end results can be disappointing. Agencies,

jurisdictions, and levels of government compete for scarce dollars, inhibiting the partnership and leadership required to develop interoperability.

- ◆ The human factor is a substantial obstacle—agencies are reluctant to give up management and control of their communications systems. Interoperability requires a certain amount of shared management, control, and policies and procedures.
- ◆ There is a limited and fragmented amount of radio spectrum available to public safety.



*This is a job that requires policy-makers across jurisdictions to work together for the common good—to plan, fund, build, and govern interoperable public safety communications systems.*

## ***What Is Radio Spectrum?***

It is electronic real estate—the complete range of frequencies and channels that can be used for radio communications. Spectrum is the highway over which voice, data, and image communications travel. Radio spectrum, one of our Nation's most valuable resources, is a finite resource—what exists today is all there ever will be.



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- Greater technical complexity in the proposed integration, making it difficult to present and therefore "sell" to stakeholders and the public.

The *National Cooperative Highway Research Program, Synthesis 337, Cooperative Agreements for Corridor Management* report, alluded to above, queried agencies about difficulties with corridor management agreements. Fifty-four percent "cited a lack of local government understanding of corridor management". Also, 23% cited the need for technical assistance as a problem in implementing specific elements of such agreements.

- Greater difficulty in securing funding for the building, operation and maintenance of the proposed system

The Kentucky Transportation Center's *Intelligent Transportation Systems Strategic Plan* (Figure 3.5) places significant emphasis on an ITS operations and maintenance plan (O&M) and lists specific challenges:

Regional  
Example

**University of Kentucky  
Kentucky Transportation Center  
Intelligent Transportation Systems Strategic Plan**

## 8.0 ITS OPERATIONS AND MAINTENANCE

To date, much of the emphasis regarding ITS within the Federal Government and state agencies has been focused on developing and deploying systems. In most cases, very little emphasis has been given to proper operation and maintenance (O&M) of those systems once they are deployed. ITS technologies present some significant O&M challenges to traditional transportation agencies. Some specific challenges are listed here:

- Operating advanced systems requires a high level of integration among existing systems and agencies.
- Deployment of new systems places an additional burden on existing operations and maintenance personnel, who already have responsibilities and may already be overloaded. These personnel must then deal with conflicting priorities.
- When new systems are deployed, it is not always clear who is to have responsibility for operating and maintaining them.
- Operating advanced systems requires new skills and capabilities, which may not exist in a traditional transportation agency. This creates a need to train existing personnel and/or add new personnel.
- Maintaining ITS technologies requires a high degree of technical proficiency, with specialized skills and expertise. Again, this necessitates training of existing personnel and/or hiring new personnel.
- Deployment of non-standard devices and systems can create an operations and maintenance headache, with non-standard interfaces, additional training requirements, and excessive spare parts requirements.

With these challenges in mind, it is important that every new ITS project include full consideration of how the system will be operated and maintained. This would include a clear assignment of responsibility, delineation of training requirements, selection of a maintenance approach (in-house, contract, etc.), and any standardization requirements. These considerations should be brought in at the earliest stages of planning the project, and should continue to be included throughout all stages of the project development.

In addition to including O&M considerations in project planning and development, the Transportation Cabinet should develop an ITS Maintenance Plan. This plan would be developed with heavy stakeholder involvement, and would lay out the Cabinet's strategy for effectively and efficiently maintaining all of its ITS deployments. At least one other state (Oregon) has developed an ITS Maintenance Plan, and several metropolitan areas have developed maintenance models. The work of these agencies could be used as a model or a starting point for the Kentucky plan.

Figure 3.5 - Kentucky Transportation Center's Intelligent Transportation Systems Strategic Plan

Section 8.0 of this document is displayed. It outlines Operations and Maintenance challenges involved in deploying ITS systems.

The use of Systems Engineering is essential to the surmounting of these obstacles and to the successful implementation of a regional initiative.

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## 3.5 CHAPTER SUMMARY

This chapter described the context wherein regional transportation projects emerge and the relationship between planning activities and a Concept of Operations for a regional initiative. It discussed the necessity of developing a Concept of Operations, as part of the systems engineering process, for a regional integration project and addressed the challenges posed by the demands inherent in such a project.

## 3.6 SPECIFIC LITERATURE SUPPORTING THIS CHAPTER

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- National ITS Architecture Version 5.1, U.S. Department of Transportation, <http://www.iteris.com/itsarch/>
- *Regional Transportation Operations Collaboration and Coordination: A Primer for Working Together to Improve Transportation Safety, Reliability, and Security*, Federal Highway Administration and the U.S. Department of Transportation. 18 Dec 2002
- Maricopa Association of Governments. “*Regional Concepts of Final Operations: Final Report.*” November 2003, [http://www.mag.maricopa.gov/pdf/cms.resource/RCTO-Final\\_Report79101.pdf](http://www.mag.maricopa.gov/pdf/cms.resource/RCTO-Final_Report79101.pdf)
- FHWA White Paper: *Regional Concepts of Operations for Transportation System Management and Operations, Discussion Draft 2.1*, February 6, 2003
- Metropolitan Washington Regional ITS Architecture Draft Stakeholder Description  
<http://www.mwcog.org/uploads/committee-documents/t1xYV1k20050406154100.pdf>
- Cooperative Agreements for Corridor Management, NCHRP Synthesis Report 337, 2004  
[http://www.accessmanagement.gov/pdf/nchrp\\_syn\\_337.pdf](http://www.accessmanagement.gov/pdf/nchrp_syn_337.pdf)
- *When They Can't Talk, Lives are Lost: What Public Officials Need to Know about Interoperability* (February 2003), prepared through the collaboration of the following organizations: Association of Public Safety Communications, Officials International, Inc., International Association of Chiefs of Police, International Association of Fire Chiefs, International City/County Management Association, Major Cities Chiefs, Major County Sheriffs' Association, National Association of Counties, National Association of State Chief Information Officers, National Association of State Telecommunications Directors, National Conference of State Legislatures, National Criminal Justice Association, National Emergency Management Association, National Governors Association, National League of Cities, National Public Safety Telecommunications Council, National Sheriffs'

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